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June 19, 2002

Secretary
Federal Communications Commission
Washington, DC 20554

Re: ET Docket No. 95-18, Mobile Satellite Service

Gentlemen:

On June 18, 2002, Anthony Finizio, President of Microwave Radio Communications (MRC), and I met with the following FCC staff members: Geraldine Matise, Gary Thayer, John Wong, Susan Crawford, Alan Scrime, Ted Ryder, Tom Derenge and Ira Keltz. Mr. Finizio's presentation is attached.

Mr. Finizio made the following points:

- MRC and its predecessor companies have supplied at least 60% of the installed base of Broadcast Auxiliary radios that operate in the 1990-2110 MHz band, yet MRC does not have a census of 2 GHz equipment (including vintage) now in use by broadcasters;
- While current production radios can be retuned and rechannelized, older radios must be evaluated on a model-by-model basis, and older models are likely to be more expensive to retune and rechannelize than newer models;
- MRC will not retune/rechannelize radios that have been out of production for more than ten years;
- Many out-of-production radios cannot be upgraded to support digital operation;
- In addition to portable ENG radios, the population of 2 GHz fixed point-to-point intercity relays must also be evaluated;
- It is not practical to modify a radio to comply with the 14.5 MHz Phase 1 channel plan and then modify it again to comply with the 12.1 MHz Phase 2 channel plan; a one-phase changeover is necessary;
- Based on our understanding that there are 400 systems in Boston that must be retuned, we estimate there may be 12,000 systems in the top 30 DMAs;

- If it is possible to retune one DMA in a month, which may be difficult to achieve, it will take 30 months to retune the top 30 markets;
- It is not clear how to manage the retuning in adjacent DMAs, because stations from adjacent markets often cover the same news events, and ENG radios that use different channel plans can interfere with one another;
- The Phase 2 channel plan of 12.1 MHz will require that the current oscillators in all radios, which now have a step size of 250 kHz, be replaced with oscillators having a 125 kHz step size; in contrast, a channel plan one 13 MHz channel and six 12 MHz channels would not require that oscillator changeout;
- In rechannelizing, receivers will need to have IF filters replaced and may need other changes;
- In rechannelizing and retuning, antenna systems will need to have low noise amplifiers replaced; these are often mounted high on towers;
- MRC's current production radios that incorporate digital COFDM transmission can support digital as well as analog signals, and are designed to support multiple user-selectable channel plans.

Sincerely,

Jeffrey Krauss

Slide 1

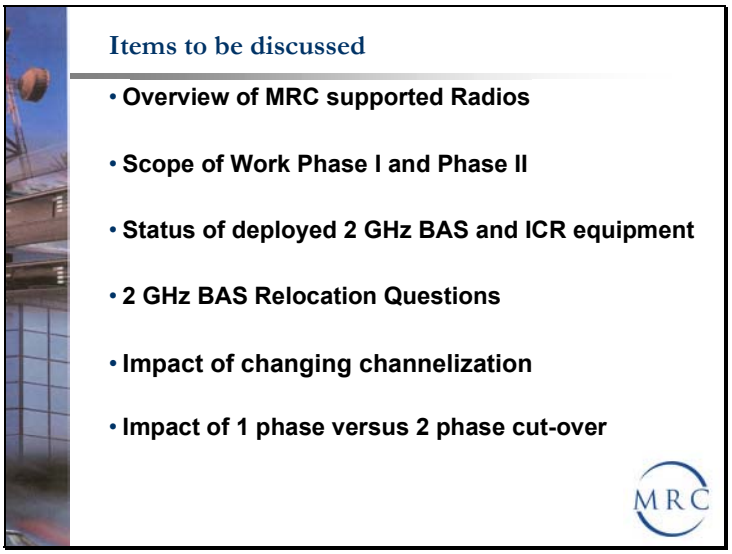
MICROWAVE RADIO COMMUNICATIONS

2 GHz BAS Re-channelization Discussions

FCC Washington
June 18, 2002

Tony Finizio, President MRC

Slide 2


Items to be discussed
• Overview of MRC supported Radios
• Scope of Work Phase I and Phase II
• Status of deployed 2 GHz BAS and ICR equipment
• 2 GHz BAS Relocation Questions
• Impact of changing channelization
• Impact of 1 phase versus 2 phase cut-over
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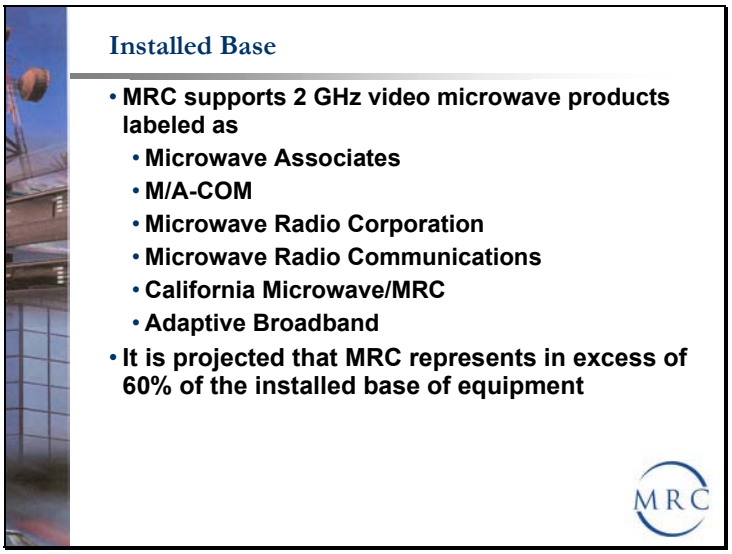

Installed Base

- MRC supports 2 GHz video microwave products labeled as
  - Microwave Associates
  - M/A-COM
  - Microwave Radio Corporation
  - Microwave Radio Communications
  - California Microwave/MRC
  - Adaptive Broadband
- It is projected that MRC represents in excess of 60% of the installed base of equipment

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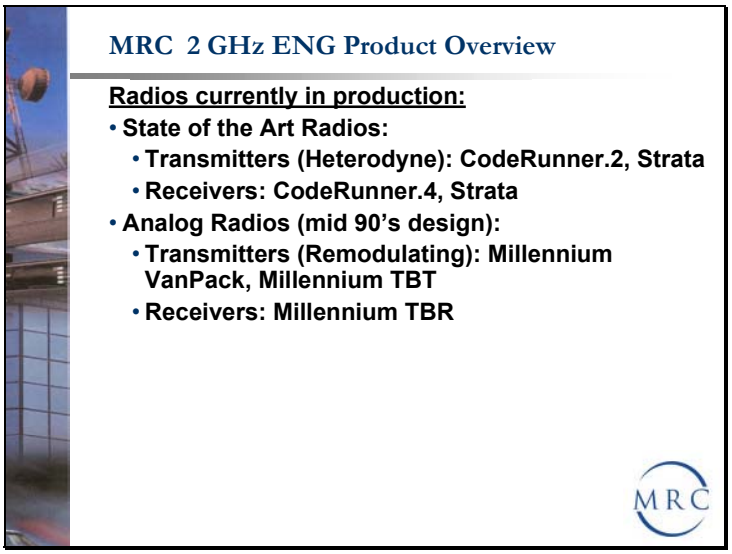
MRC 2 GHz ENG Product Overview
Radios currently in production:
• State of the Art Radios:
• Transmitters (Heterodyne): CodeRunner.2, Strata
• Receivers: CodeRunner.4, Strata
• Analog Radios (mid 90's design):
• Transmitters (Remodulating): Millennium VanPack, Millennium TBT
• Receivers: Millennium TBR
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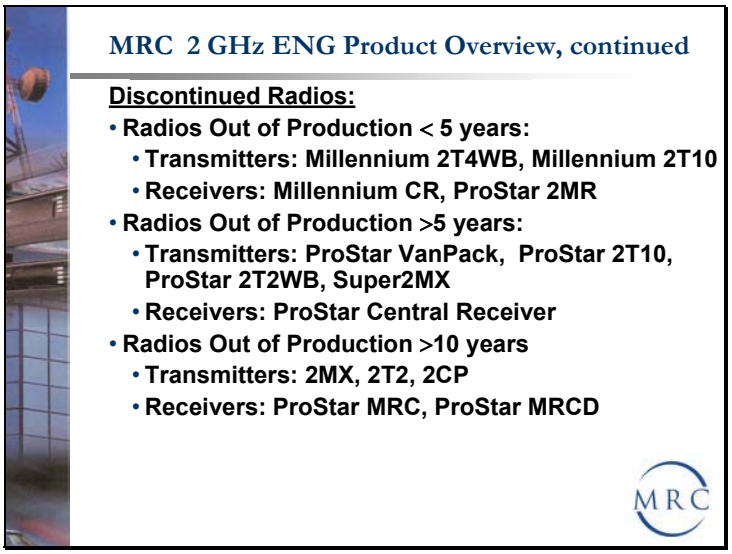

MRC 2 GHz ENG Product Overview, continued

Discontinued Radios:

- Radios Out of Production < 5 years:
  - Transmitters: Millennium 2T4WB, Millennium 2T10
  - Receivers: Millennium CR, ProStar 2MR
- Radios Out of Production >5 years:
  - Transmitters: ProStar VanPack, ProStar 2T10, ProStar 2T2WB, Super2MX
  - Receivers: ProStar Central Receiver
- Radios Out of Production >10 years
  - Transmitters: 2MX, 2T2, 2CP
  - Receivers: ProStar MRC, ProStar MRCD

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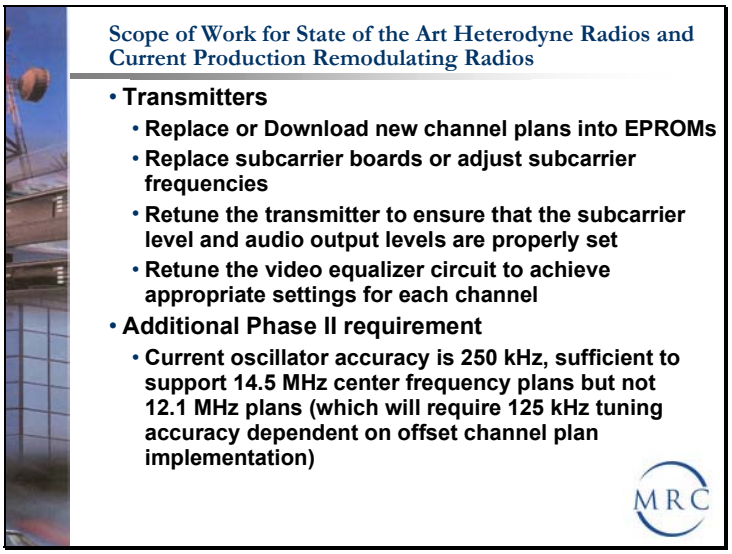
Scope of Work for State of the Art Heterodyne Radios and Current Production Remodulating Radios
• Transmitters
• Replace or Download new channel plans into EPROMs
• Replace subcarrier boards or adjust subcarrier frequencies
• Retune the transmitter to ensure that the subcarrier level and audio output levels are properly set
• Retune the video equalizer circuit to achieve appropriate settings for each channel
• Additional Phase II requirement
• Current oscillator accuracy is 250 kHz, sufficient to support 14.5 MHz center frequency plans but not 12.1 MHz plans (which will require 125 kHz tuning accuracy dependent on offset channel plan implementation)
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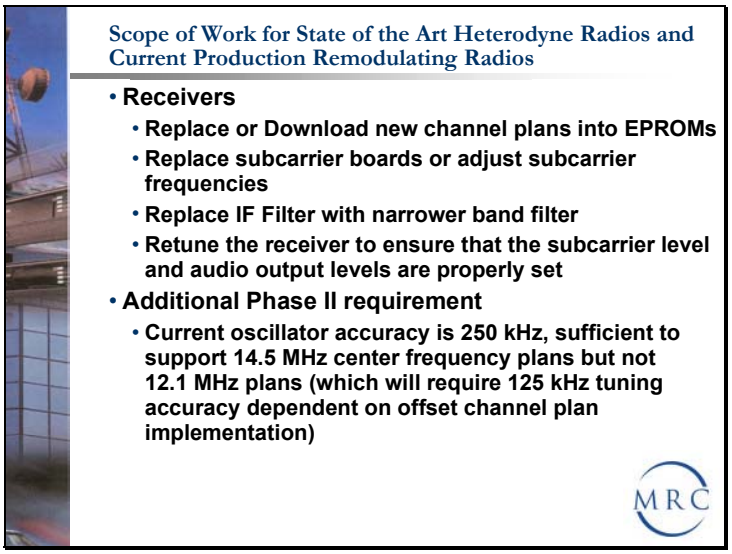
Scope of Work for State of the Art Heterodyne Radios and Current Production Remodulating Radios
• Receivers
• Replace or Download new channel plans into EPROMs
• Replace subcarrier boards or adjust subcarrier frequencies
• Replace IF Filter with narrower band filter
• Retune the receiver to ensure that the subcarrier level and audio output levels are properly set
• Additional Phase II requirement
• Current oscillator accuracy is 250 kHz, sufficient to support 14.5 MHz center frequency plans but not 12.1 MHz plans (which will require 125 kHz tuning accuracy dependent on offset channel plan implementation)
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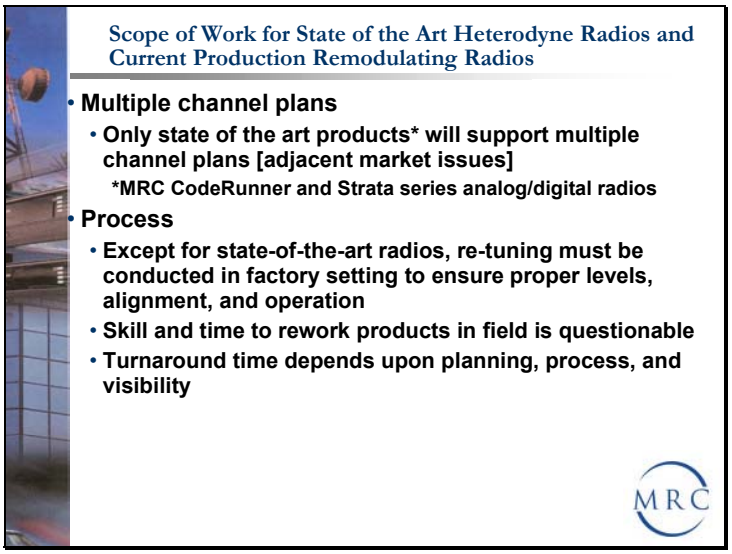
Scope of Work for State of the Art Heterodyne Radios and Current Production Remodulating Radios
• Multiple channel plans
• Only state of the art products* will support multiple channel plans [adjacent market issues]
*MRC CodeRunner and Strata series analog/digital radios
• Process
• Except for state-of-the-art radios, re-tuning must be conducted in factory setting to ensure proper levels, alignment, and operation
• Skill and time to rework products in field is questionable
• Turnaround time depends upon planning, process, and visibility
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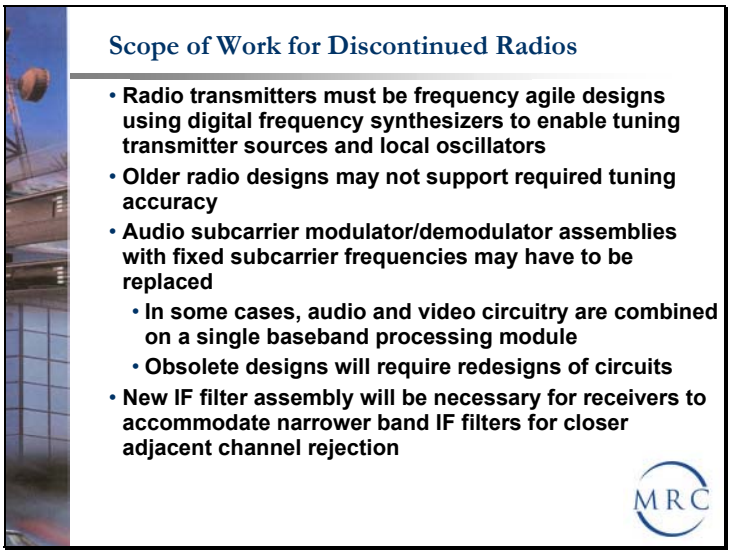
Scope of Work for Discontinued Radios
• Radio transmitters must be frequency agile designs using digital frequency synthesizers to enable tuning transmitter sources and local oscillators
• Older radio designs may not support required tuning accuracy
• Audio subcarrier modulator/demodulator assemblies with fixed subcarrier frequencies may have to be replaced
• In some cases, audio and video circuitry are combined on a single baseband processing module
• Obsolete designs will require redesigns of circuits
• New IF filter assembly will be necessary for receivers to accommodate narrower band IF filters for closer adjacent channel rejection
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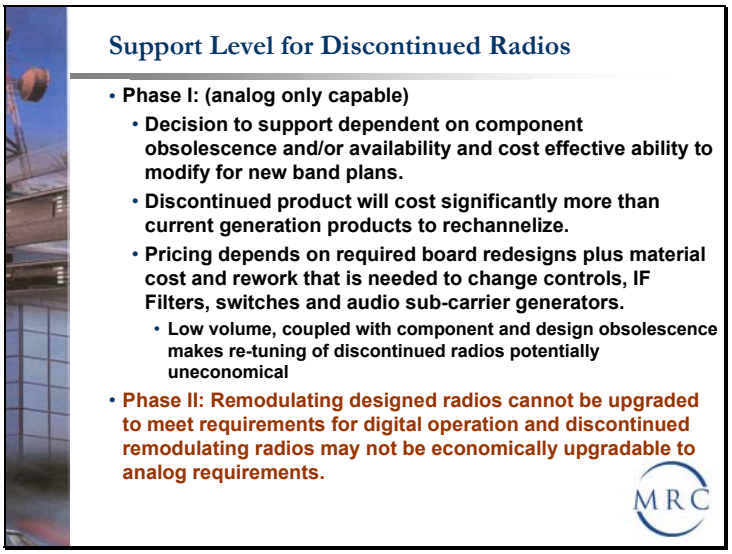
Support Level for Discontinued Radios
• Phase I: (analog only capable)
• Decision to support dependent on component obsolescence and/or availability and cost effective ability to modify for new band plans.
• Discontinued product will cost significantly more than current generation products to rechannelize.
• Pricing depends on required board redesigns plus material cost and rework that is needed to change controls, IF Filters, switches and audio sub-carrier generators.
• Low volume, coupled with component and design obsolescence makes re-tuning of discontinued radios potentially uneconomical
• Phase II: Remodulating designed radios cannot be upgraded to meet requirements for digital operation and discontinued remodulating radios may not be economically upgradable to analog requirements.
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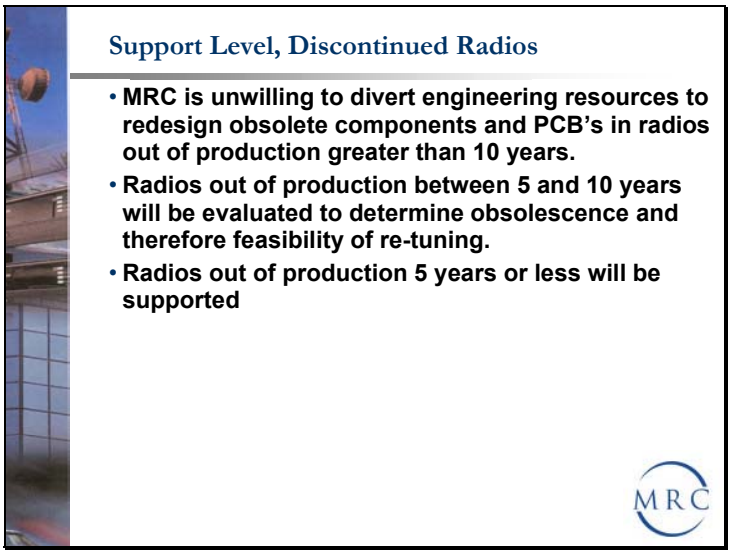
Support Level, Discontinued Radios
• MRC is unwilling to divert engineering resources to redesign obsolete components and PCB's in radios out of production greater than 10 years.
• Radios out of production between 5 and 10 years will be evaluated to determine obsolescence and therefore feasibility of re-tuning.
• Radios out of production 5 years or less will be supported
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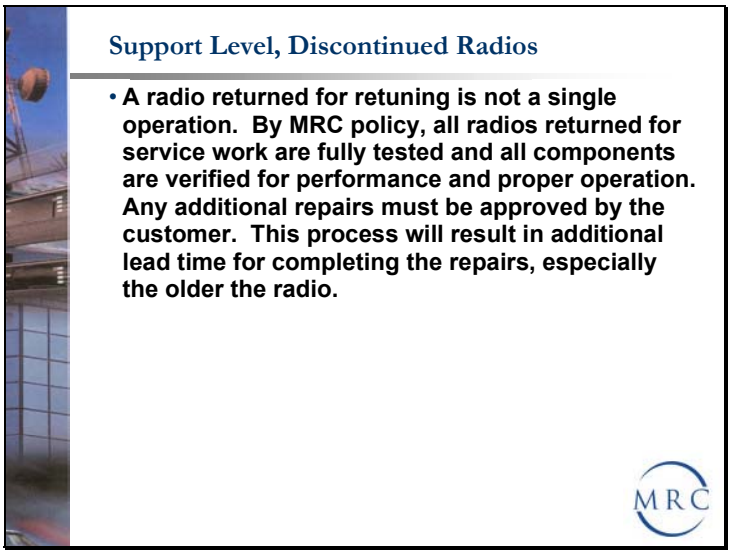
Support Level, Discontinued Radios
• A radio returned for retuning is not a single operation. By MRC policy, all radios returned for service work are fully tested and all components are verified for performance and proper operation. Any additional repairs must be approved by the customer. This process will result in additional lead time for completing the repairs, especially the older the radio.
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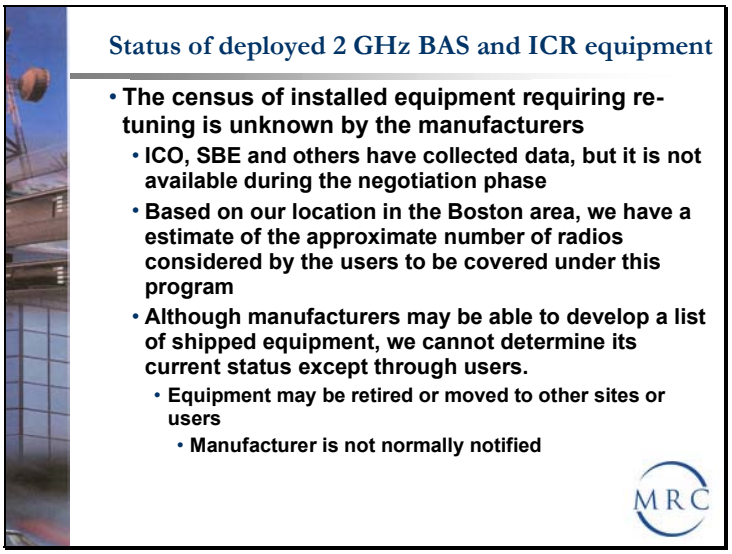
Status of deployed 2 GHz BAS and ICR equipment
• The census of installed equipment requiring re-tuning is unknown by the manufacturers
• ICO, SBE and others have collected data, but it is not available during the negotiation phase
• Based on our location in the Boston area, we have a estimate of the approximate number of radios considered by the users to be covered under this program
• Although manufacturers may be able to develop a list of shipped equipment, we cannot determine its current status except through users.
• Equipment may be retired or moved to other sites or users
• Manufacturer is not normally notified
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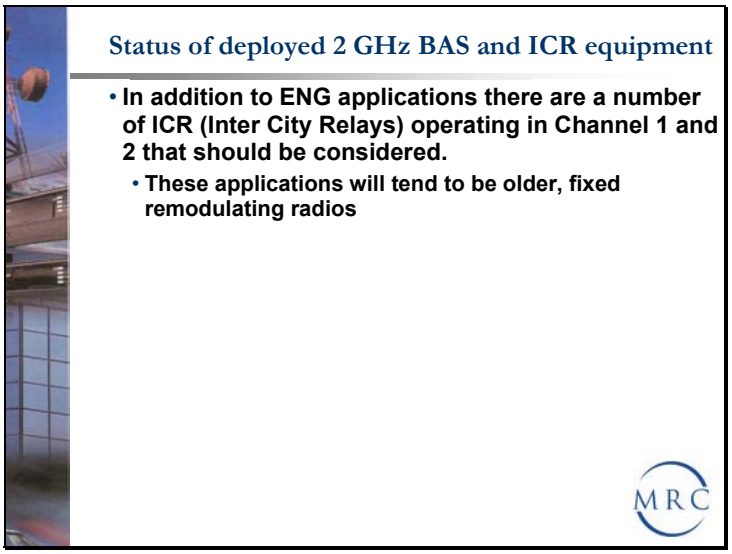
Status of deployed 2 GHz BAS and ICR equipment
• In addition to ENG applications there are a number of ICR (Inter City Relays) operating in Channel 1 and 2 that should be considered.
• These applications will tend to be older, fixed remodulating radios
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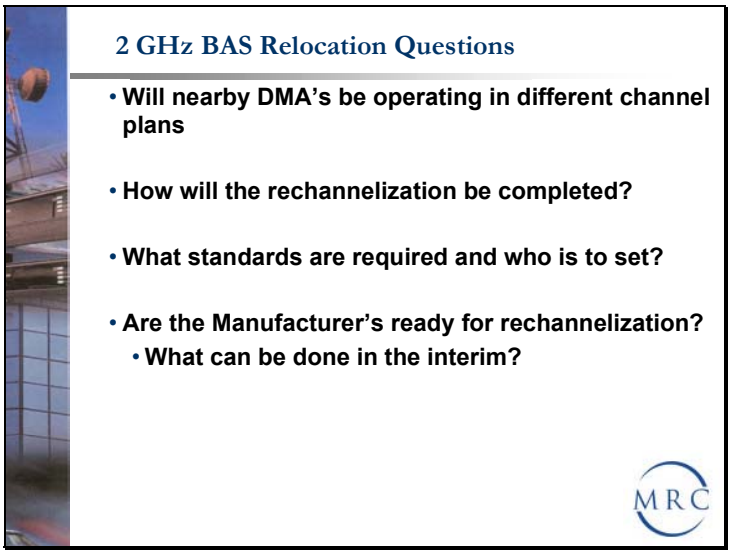
2 GHz BAS Relocation Questions
• Will nearby DMA's be operating in different channel plans
• How will the rechannelization be completed?
• What standards are required and who is to set?
• Are the Manufacturer's ready for rechannelization?
• What can be done in the interim?
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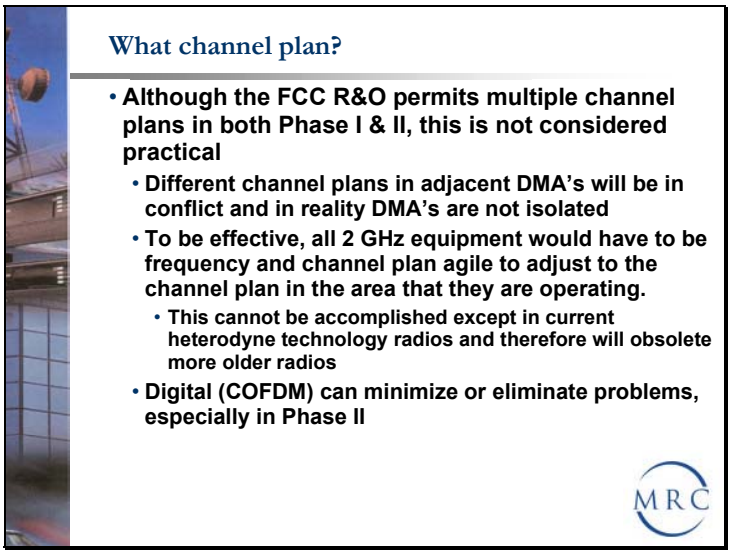
What channel plan?
• Although the FCC R&O permits multiple channel plans in both Phase I & II, this is not considered practical
• Different channel plans in adjacent DMA's will be in conflict and in reality DMA's are not isolated
• To be effective, all 2 GHz equipment would have to be frequency and channel plan agile to adjust to the channel plan in the area that they are operating.
• This cannot be accomplished except in current heterodyne technology radios and therefore will obsolete more older radios
• Digital (COFDM) can minimize or eliminate problems, especially in Phase II
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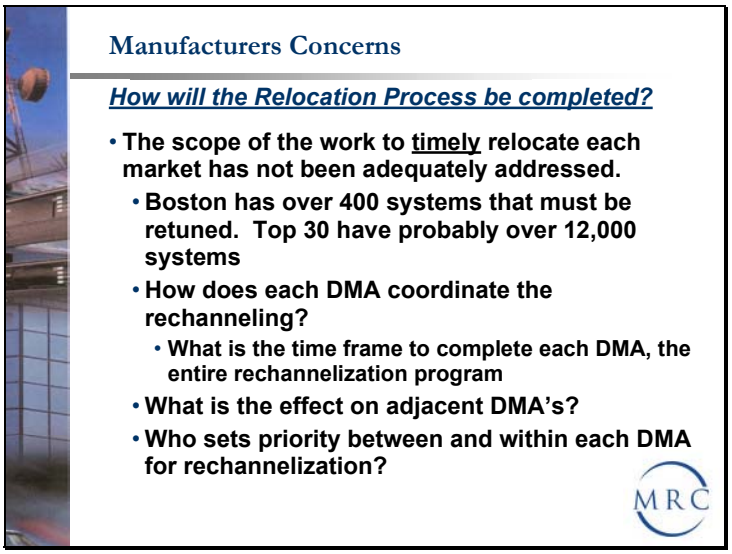
Manufacturers Concerns
How will the Relocation Process be completed?
• The scope of the work to timely relocate each market has not been adequately addressed.
• Boston has over 400 systems that must be retuned. Top 30 have probably over 12,000 systems
• How does each DMA coordinate the rechanneling?
• What is the time frame to complete each DMA, the entire rechannelization program
• What is the effect on adjacent DMA's?
• Who sets priority between and within each DMA for rechannelization?
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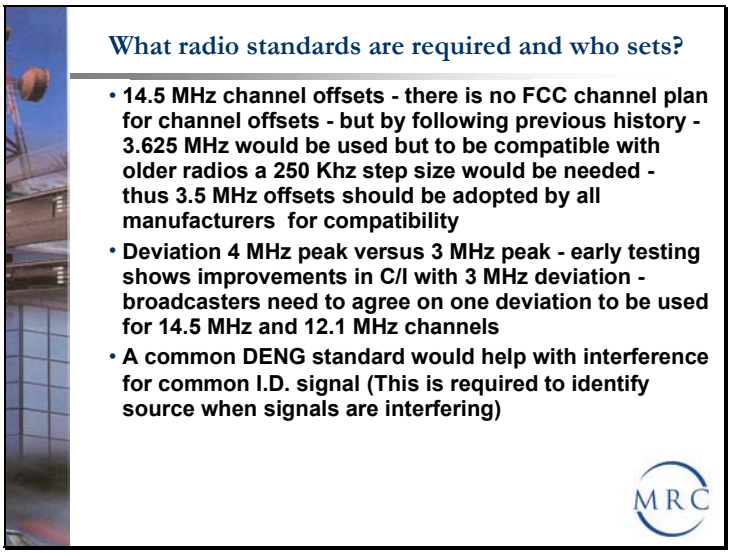
What radio standards are required and who sets?
• 14.5 MHz channel offsets - there is no FCC channel plan for channel offsets - but by following previous history - 3.625 MHz would be used but to be compatible with older radios a 250 Khz step size would be needed - thus 3.5 MHz offsets should be adopted by all manufacturers for compatibility
• Deviation 4 MHz peak versus 3 MHz peak - early testing shows improvements in C/I with 3 MHz deviation - broadcasters need to agree on one deviation to be used for 14.5 MHz and 12.1 MHz channels
• A common DENG standard would help with interference for common I.D. signal (This is required to identify source when signals are interfering)
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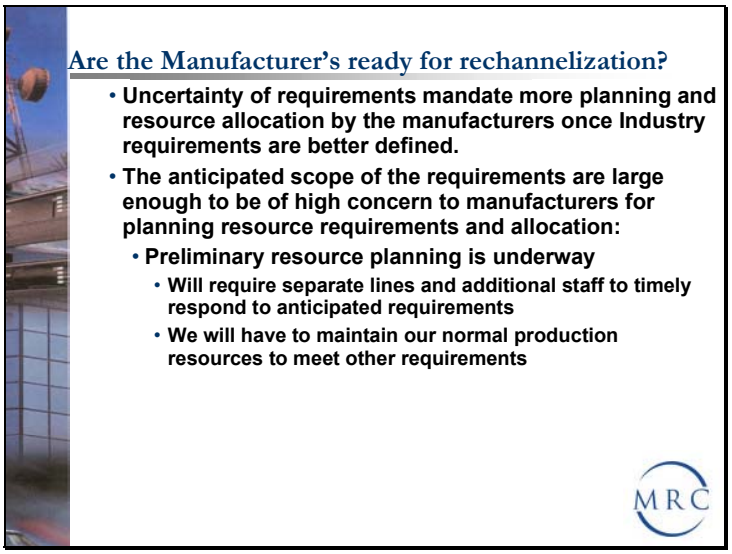
Are the Manufacturer's ready for rechannelization?
• Uncertainty of requirements mandate more planning and resource allocation by the manufacturers once Industry requirements are better defined.
• The anticipated scope of the requirements are large enough to be of high concern to manufacturers for planning resource requirements and allocation:
• Preliminary resource planning is underway
• Will require separate lines and additional staff to timely respond to anticipated requirements
• We will have to maintain our normal production resources to meet other requirements
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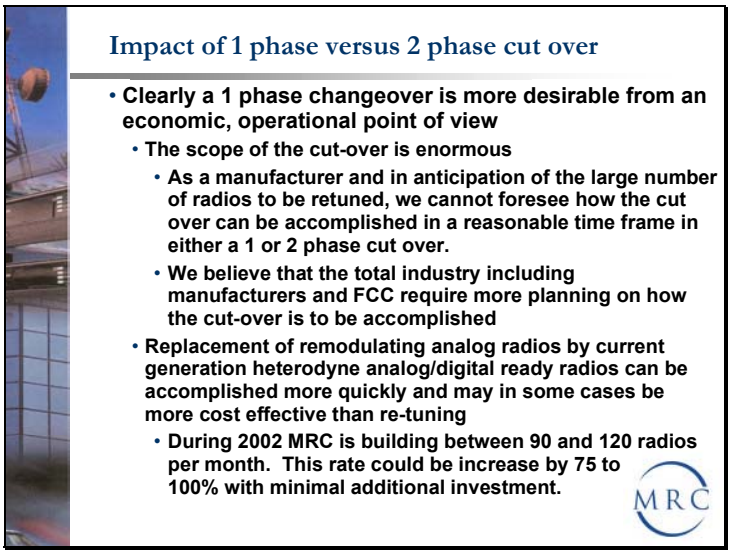
Impact of 1 phase versus 2 phase cut over
• Clearly a 1 phase changeover is more desirable from an economic, operational point of view
• The scope of the cut-over is enormous
• As a manufacturer and in anticipation of the large number of radios to be retuned, we cannot foresee how the cut over can be accomplished in a reasonable time frame in either a 1 or 2 phase cut over.
• We believe that the total industry including manufacturers and FCC require more planning on how the cut-over is to be accomplished
• Replacement of remodulating analog radios by current generation heterodyne analog/digital ready radios can be accomplished more quickly and may in some cases be more cost effective than re-tuning
• During 2002 MRC is building between 90 and 120 radios per month. This rate could be increase by 75 to 100% with minimal additional investment.
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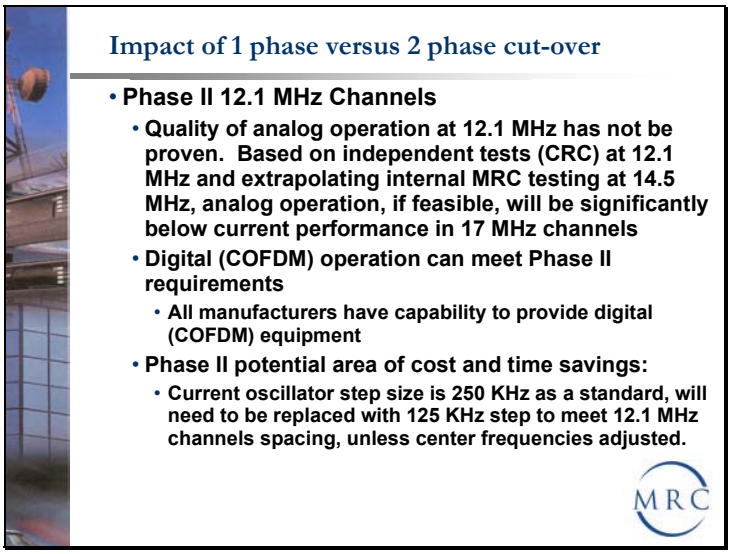
Impact of 1 phase versus 2 phase cut-over
• Phase II 12.1 MHz Channels
• Quality of analog operation at 12.1 MHz has not be proven. Based on independent tests (CRC) at 12.1 MHz and extrapolating internal MRC testing at 14.5 MHz, analog operation, if feasible, will be significantly below current performance in 17 MHz channels
• Digital (COFDM) operation can meet Phase II requirements
• All manufacturers have capability to provide digital (COFDM) equipment
• Phase II potential area of cost and time savings:
• Current oscillator step size is 250 KHz as a standard, will need to be replaced with 125 KHz step to meet 12.1 MHz channels spacing, unless center frequencies adjusted.
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Current Generation Radio Advances

- **Based on the 2 GHz BAS requirements, MRC has designed its current generation linear heterodyne analog/digital radios to be a flexible platform to meet anticipated requirements. These CodeRunner and Strata Radio platforms will ship during 2nd half 2002 and are:**
  - **Channel Frequency agile**
  - **Audio subcarrier agile**
  - **Capable of multiple channel plans and/or are field programmable**
  - **<u>Exception:</u> 250 KHz oscillator is still industry standard, change out to 125 KHz oscillators will be dependent on industry decision on center frequencies**
  - **Insignificant impact on installed 2 GHz base**

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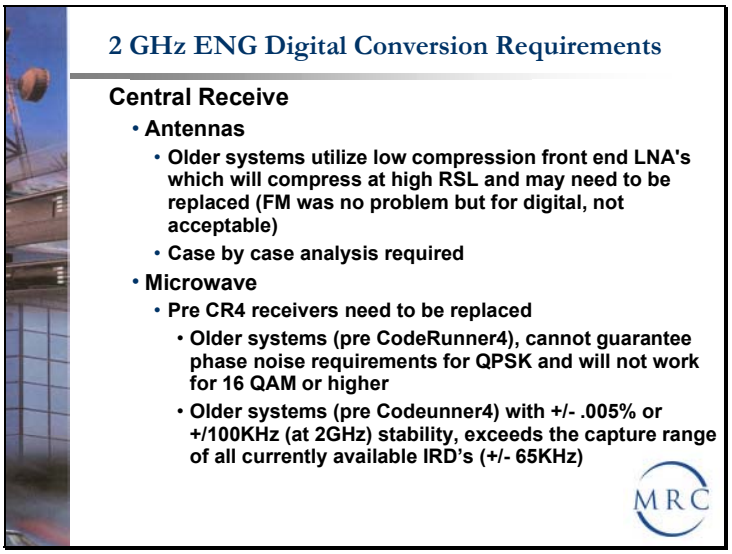
2 GHz ENG Digital Conversion Requirements
Central Receive
• Antennas
• Older systems utilize low compression front end LNA's which will compress at high RSL and may need to be replaced (FM was no problem but for digital, not acceptable)
• Case by case analysis required
• Microwave
• Pre CR4 receivers need to be replaced
• Older systems (pre CodeRunner4), cannot guarantee phase noise requirements for QPSK and will not work for 16 QAM or higher
• Older systems (pre Codeunner4) with +/- .005% or +/100KHz (at 2GHz) stability, exceeds the capture range of all currently available IRD's (+/- 65KHz)
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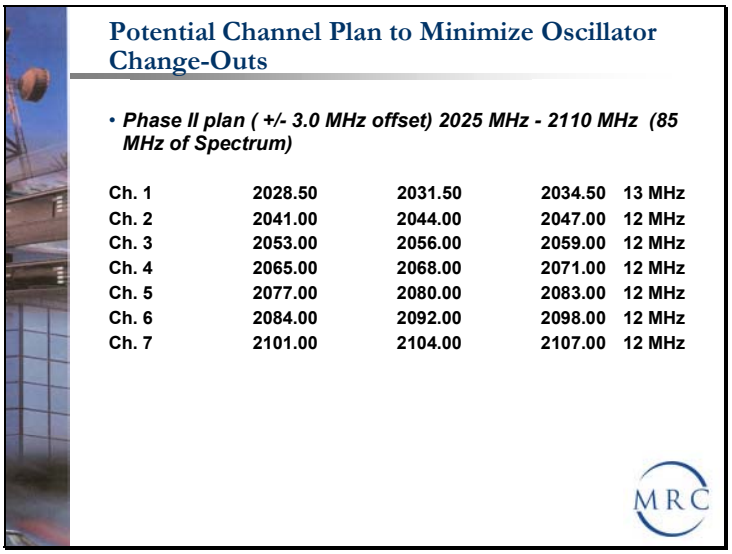
Potential Channel Plan to Minimize Oscillator Change-Outs
• Phase II plan (+/- 3.0 MHz offset) 2025 MHz - 2110 MHz (85 MHz of Spectrum)
Ch. 1 2028.50 2031.50 2034.50 13 MHz
Ch. 2 2041.00 2044.00 2047.00 12 MHz
Ch. 3 2053.00 2056.00 2059.00 12 MHz
Ch. 4 2065.00 2068.00 2071.00 12 MHz
Ch. 5 2077.00 2080.00 2083.00 12 MHz
Ch. 6 2084.00 2092.00 2098.00 12 MHz
Ch. 7 2101.00 2104.00 2107.00 12 MHz
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